



Effects of climate model interdependency and common biases on the uncertainty quantification of extreme rainfall projections

Sunyer Pinya, Maria Antonia; Madsen, H.; Rosbjerg, Dan; Arnbjerg-Nielsen, Karsten

Published in:

Abstract proceedings 7th Annual Meeting Danish Water Research and Innovation Platform (DWRIP) – Forsknings- og Innovationsplatformen Vand

Publication date:

2013

Document Version

Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

Sunyer Pinya, M. A., Madsen, H., Rosbjerg, D., & Arnbjerg-Nielsen, K. (2013). Effects of climate model interdependency and common biases on the uncertainty quantification of extreme rainfall projections. In B. K. Jensen, & N. Levysohn (Eds.), *Abstract proceedings 7th Annual Meeting Danish Water Research and Innovation Platform (DWRIP) – Forsknings- og Innovationsplatformen Vand* (pp. 23). The Danish Water Research and Innovation Platform.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Abstract proceedings

7th Annual Meeting Danish Water Research and Innovation Platform (DWRIP) – Forsknings- og Innovationsplatformen Vand

Technical University of Denmark
Building 308
DK-2800 Lyngby

31 January 2013

Edited by B.K. Jensen and N. Levysohn

List of contents

	Page
Session 2: Research and development in low- and middle income countries	3
<i>P.E. Holm: Water and Environment theme, Sino-Danish Center for Education and Research (SDC), Beijing</i>	3
<i>L.F. Jørgensen and H. Dissing: China Europe Water Platform (CEWP)</i>	4
<i>S. Stisen et al.: Hydrological modelling for climate change and water management impact assessment in data sparse regions</i>	5
<i>M. Chongo et al. Geophysical and geochemical characterisation of groundwater resources in Western Zambia</i>	6
<i>M. J. Calopietro et al.: SUSA Ghana – A multi-disciplinary research project on sustainable sanitation in peri-urban Ghana</i>	7
<i>F. Plauborg et al.: Growth, yield and WUE of drip and sprinkler irrigated okra grown on sandy soil under semi-arid conditions in Southeast Ghana</i>	8
Session 3: Water and health	9
<i>C. Jørgensen: Water and Health – Challenges in Denmark today</i>	9
<i>S.M. Kristiansen et al.: Iodine in Danish ground and drinking water – preliminary speciation results and design of a nationwide sampling campaign</i>	10
<i>A. Forslund et al.: E. coli contamination and health aspect associated with the use of on-site treated wastewater and canal water for irrigation of potatoes and tomatoes</i>	11
<i>A. Erichsen et al.: Bathing water: Risk, solutions, and monitoring. Case: Ironmen swimming in diluted wastewater</i>	12
<i>J. Clauson-Kaas: Flooding and health risks - What will Greater Copenhagen Water Company do?</i>	13
<i>H.-J. Albrechtsen: Drinking water – Risks, solutions, and monitoring. Case: Nørrebro</i>	14

Effects of climate model interdependency and common biases on the uncertainty quantification of extreme rainfall projections

M. Sunyer, DTU Environment*, H. Madsen, DHI**, D. Rosbjerg, DTU Environment⁺, K. Arnbjerg-Nielsen, DTU Environment⁺⁺.

Abstract

Climate models are the primary source of information in climate change impact studies but they are inherently uncertain. In recent years, probabilistic procedures based on multi-model ensembles have been suggested in order to estimate this uncertainty. However, there are still several challenges in the interpretation of multi-model ensembles, e.g. limited number of data, lack of agreement on what is a good model, biases in climate models, and interdependency of climate projections.

This study investigates the effects of interdependency and common biases in an ensemble of regional climate models (RCMs) on the uncertainty quantification of extreme rainfall projections in Denmark. A Bayesian approach has been developed using the procedure suggested by Tebaldi et al. (2005) in order to quantify the uncertainty. This approach takes into account both the correlation between the climate models and the common biases. The correlation matrix is estimated using the approach suggested by Pennel and Reichler (2011) to estimate the effective number of models in an ensemble. The common bias is included as a parameter in the Bayesian inference.

The results show that the climate model projections cannot be considered independent. If the models are assumed independent, the results will be overconfident. The effect of accounting for the common biases is smaller than accounting for the interdependency of the RCMs. This is possibly due to the bias being assumed constant from present to the future. Further work will investigate the assumption of constant bias. This study highlights the importance of investigating the assumptions underlying multi-model ensembles. These may have serious consequences in the design of climate change adaptation strategies.

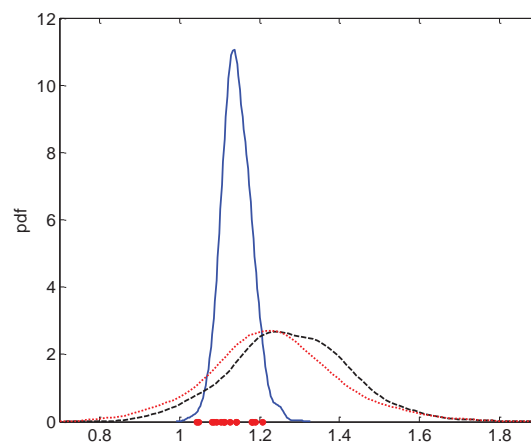


Figure 3- Probability density functions of the relative change of the 95% quantile of wet day rainfall amounts. The results from three different tests are shown: (i) the models are assumed independent and the bias is neglected (blue line), (ii) the interdependency is included in the analysis but the bias is neglected (black dashed line), (iii) both the interdependency and the bias are included in the analysis (red dotted line). The red dots are the outputs from each of the RCMs.

References

- Tebaldi, C., Smith, R., Nychka, L. & Mearns (2005), 'Quantifying uncertainty in projections of regional climate change: a Bayesian approach to the analysis of multi-model ensembles', *Journal of Climate* 18, 1524–1540.
 Pennel, C. and Reichler, T., 2011. On the effective number of climate models. *Journal of Climate* 24, 2358–2367.

* (masu@env.dtu.dk): Miljøvej Building 113, DK-2800 Kgs. Lyngby, Denmark

** (hem@dhigroup.dk): Agern Allé 5, DK-2970 Hørsholm, Denmark

⁺ (darro@env.dtu.dk): Miljøvej Building 113, DK-2800 Kgs. Lyngby, Denmark

⁺⁺ (karn@env.dtu.dk): Miljøvej Building 113, DK-2800 Kgs. Lyngby, Denmark